CLAIMS

1. All-optical converter (10) for converting an optical signal modulated in intensity into an optical signal modulated to the DPSK format, characterised in that it comprises:

- a first input (152a) for a first intensity-modulated optical signal (12);

- a differential encoding module (100) adapted to perform a differential encoding between the first signal (12) and a second optical signal synchronous with the first signal (12);

- a device adapted to modulate (200) adapted to modulate the phase of an optical signal (16) according to the differential encoding performed by the differential encoding module (100);

- an output (162c) of the device adapted to modulate (200) delivering an optical signal modulated to the DPSK format (14).

2. Converter (10) according to claim 1, characterised in that the differential encoding module (100) performs the differential encoding using an exclusive-OR function and a feedback loop (30).

3. Converter (10) according to claim 2, characterised in that, in order to implement the exclusive-OR function, the differential encoding module (100) comprises:

- a first optical coupler (102) whose first input (152a) is supplied with the first signal (12), whose second input (152b) is supplied with the second signal and whose second output (152d) is not connected;

- a second optical coupler (104) whose first input (154a) is supplied by the first output (152c) of the first coupler (102), and whose second input (154b) is not supplied;

- an absorbing non-linear device (110) whose input is supplied by the second output (154d) of the second coupler (104); and

- a third optical coupler (106) whose first input is supplied by the first output (154c) of the second coupler (104), whose second input (156b) is supplied by the output of the absorbing non-linear device (110), whose second output (156d) is not connected and whose first output (156c) delivers the signal representing the result of the exclusive-OR function.

4. Converter (10) according to claim 3, characterised in that the differential encoding module (100) comprises a fourth optical coupler (108) whose first input (158a) is supplied by the first output (156c) of the third coupler (106), whose second input (158b) is not supplied, whose first output (158c) supplies the device adapted to modulate (200) and whose second output (158d) supplies the feedback loop (30).

5. Converter (10) according to one of claim 2 to 4, characterised in that the second synchronous optical signal is delivered by the feedback loop (30).

6. Converter (10) according to claim 5, characterised in that the feedback loop (30) comprises an optical phase shift device (112) and an optical amplifier (114).

7. Converter (10) according to claim 6, characterised in that the feedback loop (30) also comprises a tuneable optical delay device (116) adapted to delay the second signal with respect to the first signal (12) with an integer number of bit times.

8. Converter (10) according to one of claims 1 to 7, characterised in that the device adapted to modulate (200) comprises a coupler (202) whose first input (162a) is supplied by the signal encoded by the differential encoding module (100), whose second input (162b) is supplied by a signal out of phase by $\frac{\pi}{2}$ with respect to the encoded signal, whose second output (162d) is not connected and whose first output (162c) delivers an optical signal modulated to the DPSK format (14).

9. Converter (10) according to claim 8, characterised in that the device adapted to modulate (200) comprises, upstream of its second input (162b), a tuneable optical delay device (206) adapted to delay the out-of-phase signal with respect to the encoded signal with an integer number of bit times.

10. Converter (10) according to one of claims 8 to 9, characterised in that the phase of the optical signal modulated to the DPSK format (14) varies from zero to π according to the result of the exclusive-OR function.

11. Converter (10) according to one of the preceding claims, characterised in that the optical couplers (102, 104, 106, 108, 202) are 3dB optical couplers.

12. Converter (10) according to claim 11, characterised in that the first signal (12) has an amplitude of E_0 and the second signal has an amplitude of E_0 and a phase difference of $-\frac{\pi}{2}$ with respect to the first signal (12); in that the optical amplifier (114) has a gain of 12.04 dB; in that the absorbing non-linear device (110) has a threshold slightly greater than $\alpha^2.E_0$ with $\alpha=\frac{\sqrt{2}}{2}$; in that the signal supplying the second input (162b) of the coupler (202) of the device adapted to modulate (200) has an amplitude of $\frac{\alpha^4}{2}.E_0$ and a phase shift of $\frac{\pi}{2}$ with respect to the signal supplying the first input (162a) of the coupler (202) of the device adapted to modulate (200).